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AN OPEN-ENDED FUTURE? IN DEFENSE OF A
NEW HUMANISM

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Translation of "Zukunft mit offenen Grenzen?
Plaedoyer fuer einen neuen Humanismus",
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16. Abstract The edge between technology and humanism is discussed. Advances in biology, in medicine, energy technology, tools and weapons, communications, psychology, problem solving and information storage, transportation and other fields are presented. A discussion is given of ecology in self-transcendence, and space travel as a survival tool.					
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By Jesco von Puttkamer

At the center of our Western World stands Homo Faber, the acting man.

This is particularly true of those of us who are members of the engineering sciences: we, more than anyone else in our modern materialistic society, are seen as exponents of change. It is not only space travel (my profession), but the full spectrum of science and technology with which man has taken possession of nature - both the external and the internal - to mold it to his needs.

This is not a manifestation of our times: in antiquity this acquisition was accomplished by means of magic, through the creation and worship of powerful gods - the creation of a myth. It has only more recently, beginning with the Renaissance, taken the form of partially irreversible interventions in Nature, which can not be reversed. As a consequence, in the last three and a half centuries since Descartes we have experienced a growth in science, technology and economic prosperity unparalleled in History. It was perhaps unavoidable that such ruthless growth processes be necessarily followed by a negative reverse side, which by now has become overpowering.

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WALKING THE EDGE BETWEEN TECHNOLOGY AND HUMANISM

Today, the change of which I speak has become so impetuous that our current generation has become the most dynamic of all time /2 since man started forming sociocultural systems three million years ago, with the discovery of fire - symbolized in myth by Prometheus, who stole the power of the gods and gave it to Man - language, tools, clothes, means of conveyance and weapons. A few generations were enough to create a situation that from an historical perspective is absolutely novel: for the first time in his history, Man today is able to (1), manipulate, control and change his own biological heredity, (2) achieve collective self-destruction by manipulating the building blocks of his world, (3) to create a worldwide communications and information network of never imagined scope and surprising effectiveness, and (4) to throw off the shackles of his planet on the way to his dispersion in the Universe. We shall presently return to this impetuosity of our life; first, let us look at its effects.

Today's problem is obviously that of the contradiction between Nature and our industrial society, the separateness of body and soul, of spirit and matter, of science and religion, of knowledge and wisdom. In the early days of his development, Man's views were still oriented towards a whole; "integrated". It was the mythical phase of his growth process. Today such models of the world can at best be found in the East, perhaps in India. Western man is split down the middle. This fragmentation leads to the repeated polarization of modern society in its growth processes.

The dichotomy of technology and nature, and beyond that, of body and spirit, places us face to face with a deeply frightening dilemma. The modern technologies of the physical and biological /3 sciences pose moral problems. People are afflicted by a growing

concern that the belief in progress might ignore the need for an equally progressing intra and interhuman development capable of coping with these problems. The dilemma becomes even more difficult because in this situation the collective society hardly finds the time to come to terms with two essential issues: the nature of change as a characteristic of life and the need for a new ethics resulting from it.

Before we consider how we should act in these rapids in the current sweeping us into the third millenium, as human beings endowed with reason in general, and as engineering professionals in particular, we must first briefly deal with technological progress itself. Let us start with the evidence: What is really the matter with this impetuosity in technological/scientific development? Are we really on the verge of an explosion of technology, as many an article would have us believe?

Not at all. But on the other hand, neither is technological development a smooth and steadily progressing process. It is not a smooth curve, with an easily predicted linear increase in our various capabilities in key areas such as transportation, energy, food supply and public health. On the average, technological progress is neither linear nor exponential: it has the non-linear characteristics of a staircase, with steps and landings. It is characterized by ever higher performance plateaus, following each other, which we climb in a cyclically repetitive pattern: an S-shaped rise of initially tentative, then rapid and then again slower growth. After reaching each landing we see a pause for recovery, a period of consolidation, a feedback coupling and assimilation of our new-found capabilities into our /4 socio-cultural fabric - until we are impelled to storm the next plateau by the crowding thrust of new technologies and the undertow of new human demands.

Thus the evolution of technology takes place in an alternating

pattern of progress and consolidation pauses. It thus reflects the reaction of every natural development, both to external pressure and stress situations and the tendency of the bulk of the culture to reach the promising development and detain it long enough to assimilate it - i.e., to "digest" and understand it - and to incorporate new impulses from the human environment and new corrections, based on the errors committed in the process. Progress is therefore marked, on the one hand, by life's thrust towards growth - of which we shall speak, yet - and on the other (in the language of the systems engineers), by the control circuit of the negative feedback loop, without which no complex system can either exist in a stable manner, or yet grow, in the long run.

IN THE RAPIDS OF A DYNAMIC TIME STREAM

Today we find enormous, and for the most part unexpected, quantum leaps occurring in all areas of our society. Because of the surprise and due to the dynamics developed by the systems themselves, the control signals for this negative feedback loop - or more precisely, because of our lack of preparation for dealing with it - often arrive too late to prevent serious errors. However, the control signals seek to compensate for this delayed reaction by sudden overcontrol, resulting in further diverging deflections. The aircraft designer familiar with the phenomenon of "pilot-induced oscillations" knows what I am referring to.

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The new quantum leaps by means of which we seek to build a cultural niche for ourselves in Nature, and all of which appear equally unexpected and unavoidable, are: in BIOLOGY, the

breakthroughs in molecular biology and genetic technology, with DNA recombination and cloning; in MEDICINE, the combination of body and the cybernetics of modern microelectronics, with the transplantation of organs, even artificial ones, or even cloned organs, more recently even with test-tube grown skin grafts; in ENERGY technology, nuclear power and solar energy; in the ENVIRONMENT, the development of new environment design and housing technologies: above ground, underground, on the polar caps, at the bottom of the sea and in space; in the TOOLS AND WEAPONS area, the "artificial intelligence" of automation, but also the new nuclear, laser and particle weapons; in the COMMUNICATIONS area, worldwide satellite TV and interactive cable TV; in PSYCHOLOGY, behavior modification; in the ECONOMY, the credit card; in the area of TRANSPORTATION, new traffic systems on the ground (Shinkansen, TGV, Mag-Lev), in the air (jumbo jets, Concorde) and in space (space shuttle); in PROBLEM SOLVING and INFORMATION STORAGE, electronics and main-frame computers, and as the MECHANISM OF CHANGE and CONTROLLED PROGRESS, systems analysis and system thinking with modern program management.

Nuclear power has been likened to the discovery of fire, TV with Gutenberg's invention of the printing press and our steps into space, with the opening-up of the American West by the pioneers of the 19th century. It is obvious that a new civilization is coming into being all around us, placing us at the threshold of a new upheaval, as did the agricultural and the industrial revolutions. We are living already in the transition period, an age of transition, and today's technology - which really is yesterday's technology - is only a technology of change, pro- /6
visional and unfinished. And I am thinking here not only in passing of the extremely urgent, even burning problem complexes of waste product disposal and recycling on the widest possible scale, as well as the development of practical cyclic processes for non-renewable resources and raw materials.

We can anticipate that the newly emerging possibilities - which are all appearing at approximately the same time - will bring the current transition phase to a close. Based on the cost of their introduction and the corresponding amortization period, they will presumably determine our future for a long time and thus give rise to a new cultural plateau. We would then be past the rapids. It seems almost a miracle that in the process we should be able to recognize the problems accruing from our forced evolution ahead of time and to test them for the demands they will place on us, before they become "faits accomplis". This is a unique privilege for a species in the entire history of civilization, and it must be experienced as all the more tragic that in general, as a collective society, we are not capable of realizing this expectation.

What is really the issue, in this fear of technology, this hostility towards technology, which must particularly affect us, as engineers?

It is a long known and widely disseminated error of our futuristic scenarios - explainable in terms of the anthropocentricity of our traditional concept of the world - to view man as a static element in a dynamically changing technological environment. Thus, while we can imagine the progress to be expected and even possible future quantum leaps in technology, we refer their effects to ourselves, instead of the corresponding man of the future. As would have to be expected, one thereby comes to the erroneous conclusion that man is unable to keep up /7 with this astonishing pace, that he lacks the necessary understanding. The result is fear. Thus, from the anachronistic confrontation between the man of today and the world of tomorrow there arises an aspect of fear of technology and hostility towards technology that is really generated by a not otherwise defined feeling of being threatened.

THIRD MILLENIUM MAN

Obviously, the fact that man grows with his environment, with his technology - much as parents grow with their children - is disregarded, as a rule. For the man of tomorrow, whose world we are busily creating, is NOT identical with the man of today; he is a new human being, able to deal with the large-scale systems created at the same time he was, but alien to us in many ways, and even incomprehensible. "Created at the same time" means, for us, that together with the creation of the future technological-scientific large-scale systems, we must co-create also tomorrow's integrated man. This means that we no longer may develop technology without reference to man - as we have been doing - or large-scale systems without ethical reason, or the external, materialistic world without inner, humanistic values. Particularly for engineers, whose machines develop their own dynamics, with their increasing independization, the co-creation of third millenium man may not be any less important than the creation of our technology, because they are inseparably intertwined.

The feeling of being threatend, on which the fear of technology is based, emanates from machine systems we can not understand. But we can not blame the machine for this - even though it is often done - only man; it is he who does not understand. In fact, the latest technology, although "fascinosum et tremendum", need not be threatening, even if it were intrinsically dangerous. /8

Even more while a creation of the rational mind, the machine may - even if it may appear surprising - open doors to irrationality. I am thinking here of the beautiful antique fresco room in the restaurant "Le Train Bleu", at the Gare de Lyon, in Paris: from its windows we can look out on the super-

modern trains of the "TVG", the fastest railroad in the world - a very stimulating contrast. Or of the space shuttle, as it soars into the air from its cradle in the middle of the bird sanctuary on Merritt Island, which it shares with the turtles, alligators and sea eagles, surrounded by silver herons, pelicans, wild geese and seagulls. Perhaps it is not surprising that such a contrast particularly sharply outlines this example of the most modern technology, rather than being in contradiction with it. It is peculiar, however, that often this contrast endows the old, the established, with a new value dimension, a new aspect of beauty. The feelings we discover while observing a shuttle-orbiter just returned from space are not always of a technical nature, necessarily. I do not believe to be the only one who has become closer to being human and to nature by man's reputedly soulless technology. There is something numinous about this technology, by means of which we intervene in nature; it is neither alien to our nature nor "artificial", but rather within us, a part of us, and Nature and our unconscious act on us through it.

OUTWARD AND INWARD EXTENSIONS OF MAN

How is it possible to consider alien - or yet, hostile - a machine that allows man to meet others of his kind, to drive away loneliness, that transmits new knowledge to us from as far /9 away as Jupiter, that makes us more intelligent and more productive, that saves and lengthens our lives, that brings us closer to the age-old questions of the Where-from and the Where-to of our existence in the universe, which makes God seem greater, more godly?

Our technology is a manifestation of the rest of our biological-cultural evolution: new limbs, an additional brain, longer life-

spans, greater range. Technology is just as much an integral part of man as his vertical spine and the opposing thumb on his hand. Viewed from this perspective - and here too, as so many times, I shall refer to Teilhard de Chardin - there is no essential difference between the bones-and-feathers wing of a bird and the space shuttle's wings of metal and flaming tail. With the strength of his spirit, man made his technological development and his biological evolution historically equivalent.

I mean to say that this machine is no longer value-free and hence it appeals to our ethical reason, i.e., to our ability to judge good and evil. When we speak of the machines of today and of tomorrow, then we are no longer thinking of "machine" in the customary sense, those that look like machines. At one time, a machine's shape and its function were one: we could see what it was there for and what it was. Today, in the age of the computer, the software program and the networked large-scale systems, machines are more appropriately defined by their behavior and the relationship between man and machine is no longer limited to a level of similarity. As I see it, the transclassical concept of machine leads, with the increasing complexity and independization of technology and with its steadily decreasing difference /10 from man, to the cybernetic system of the future, a symbiotic alliance between man and machine, his - now grown-up - child, as we can see it even today in rudimentary form in the way young people show an affinity for and turn to computers.

In this symbiosis between man and the cybernetics of the future, the machine is no longer viewed either as man's slave, or his master, but his partner. This, however, implies the corresponding ethical reason, whose development must go hand in hand with the evolution of the complex system man/technology, if in the maelstrom of change we are to retain the measure in the technical-ecological system, and in each case, the best-possible form of being human. THIS is the new Humanism.

THE HUMANIZATION OF GROWTH

What is "Humanism"? We have traditionally ignored it, as engineers, and even today have little understanding for it, let alone, contact with it. This is a shortcoming we absolutely must shed on the way to the third millenium: the new ethics of growth do, in fact, build on the basic concepts of Humanism and on ecology awareness (of which we shall speak later). But both concepts must be seen in connection with the dynamics of growth, in order to obtain an integration model for the coming decades that is close to reality.

Since its coining by Niethammer in 1808, the concept of "Humanism" has been bent to characterize various periods of classical Greek and occidental cultural history, even though originally - in the form "umanista" - it designated the study of antiquity. As understood today, humanism reflects the complexity of the human soul: pride, skepticism, esthetics, irony and wisdom; in each case, it has in mind the best possible manner of being human. /11

The subject-object dichotomy between the physical sciences and Humanism in Descarte's Dualism of 350 years ago has led to misunderstandings on both sides, which have considerably impaired a redirection and bringing back together of these two worlds into their former whole . On the one hand, the humanist, as a non-technical being, views technology as a self-perpetuating phenomenon full of its own dynamics that has slipped away from human control, does not satisfy human needs, and has made society so complex that it can barely be controlled. He does not understand science and thus finds it boring.

On the other hand, however, scientists and technicians view the humanist - for instance, the artist - either incomprehensibly or certainly with great skepticism, and in any event with heavy suspicion of being in the presence of something atavistic, a survivor - against all rules - of times long past and which in the modern world lacks real significance. Thus, he just shakes his head and discards as nonsense any talk about, for instance, the mythical stage in the development of mankind, whose reality he is expected to accept without input from the clarity of reason.

Both sides are trapped in fateful misconceptions. But I am convinced that the representatives of the rational side - i.e., the engineer and the physical scientist - are better equipped to build the necessary bridge on which both sides must meet each other; it would not be the first time the physical sciences went through a deep-reaching change in paradigms - and profitably /12 survived it. Like it or not, in our paradoxical world it is in the end science that determines what is scientific and what is not, which of our experiences are "real", and which "unreal".

And what about the ecology? How can we simultaneously speak of growth and of our appeal to ecological reasonableness?

MODELS OF THOUGHT - YESTERDAY AND TODAY

Let us first examine the phenomenon of growth.

To the dynamization of the human living conditions in modern times corresponds a dynamization in the control of nature. If pre-Renaissance man of the 15th/16th century was still a part of Nature's hierarchical structure - at whose center he had been placed by the anthropocentrism of the theologians - today we

experience a transposition with our dynamic growth process in which man increasingly treats Nature as an object, subjugating it. But even here our own errors open our eyes: in the wake of this subjugation process we have simultaneously become aware of the inner dependence of all environmental systems. Disconcertedly, we begin speaking of ecological awareness.

Even more: in our distress we call for ecological humanism, meaning standstill and regression. With a melancholy look at the past, citizen initiatives and alternative-seeking movements seek a fundamental change in our society, towards an equilibrium economy as advocated by the "Club of Rome". Apparently no one stops to think that this thinking in terms of a static equilibrium is fundamentally anti-evolution and anti-life. (I want /13 to particularly emphasize that I am not talking against the need to develop rational cyclic systems - "recycling" - for our scarce raw materials, which play a key role particularly in a world with open borders.)

In the treatment of the thermodynamics of irreversible processes, modern systems theory teaches that a self-organization exists, in natural systems, that attempts to drive all growth phenomena - among them man - in the direction of more complex, higher kinds of aggregates. In the process, the systems show "self transcendence": they reach beyond themselves and build ever more complex, more differentiated dissipative structures -- in effect, a "negative entropy". The only precondition for these processes is that energy be supplied from the outside and that they be open, i.e., that they are not directed towards any previously established goal. They are thus predictable only to a limited extent, since often even the smallest change can entail large restructuring. Hence the emphasis changes from "goal" to "path", and equilibrium is equivalent to standing still and to death. Life consists of a dynamic imbalance and today it fluctuates more strongly than ever. These oscillations, these

"swingings of the pendulum", are precisely the precondition for growth, which is at a maximum when the pendulum is farthest removed from its equilibrium position. The apparent rootlessness of this dynamics frightens man, who does not see the natural law behind it, but who as a living system can not do without it.

If today's alternative movement speaks of ecology, a static equilibrium and of Gaia, it thinks in the terms of Ernst Haeckel who in 1866 coined this concept - of the management of the nature of our immediate environment on Earth, its meadows and forests, /14 rivers and lakes, trees and mountains, water and air, as well as the cycles established among them. It points to the contamination and destruction of nature, the concrete runways of airports and freeways and to the forests losing their needles and leaves - and sees returning to a mythical past as the only answer. This we can well understand.

However, the entropic equilibrium society belongs to an era long past ; it is not the answer to this pressing dilemma. In our complex society such a way of thinking is as awkward as the mechanistic manner of thinking of the last three and a half centuries, which created the dilemma. Both arise out of either/ or thinking of Aristotelian logic, into which man divided the world to facilitate decisions; in the process, reality became mutilated. Much better suited to our complex society is the complementary thinking of the "not only, but also", evolved by Niels Bohr and Werner Heisenberg in view of the paradox in microphysics.

ECOLOGY IN SELF-TRANSCENDENCE

Man has always transformed Nature - and vice versa. Today, an awareness expansion has been added that includes the space

beyond the atmosphere within the concept of ecology. Space has become a solid constituent of our existence, and space travel has reached a level of priority in modern civilization whose significance becomes clearest if we attempt to imagine the deeply unsettling effect on man's everyday life and business world of our industrial society if we had to suddenly forego all space travel-derived benefits. In addition, the safety of the western world would be threatened. There is no doubt but /15 that while our world has become dependent on space travel, because it initiated a process that expanded our natural, technological and social environments to areas beyond the atmosphere and the gravity of Earth, energy restrictions and other interference fields, thereby introducing entirely new socio-ecological control circuits that interconnect the infrastructures of our living spheres with ever greater internal complexity and whose removal becomes inconceivable.

However, this means that today the cycle system can no longer be viewed in the sense of Haeckel, in 1866, but must be considered as a "superecology" of the cohesive system man-Earth-space. To speak of the conquest of space is self-delusion: we do not "conquer" space at all, since we have always been a part of it. If today we are permanently opening up the portion of space close to Earth, then we are merely stepping into the front yard of our environment. This is already perfectly clear in the self-understanding of our children: for them the Apollo moon landings are just as much history as Columbus and Napoleon were for us in the older generation. Antheus, the mythical giant who symbolically gathered his strength from Mother Earth as the archetype of Nature, would today regenerate himself from cosmic substance.

Hence, we should not view space travel as another engineering-scientific discipline - as "technology" - because that would be erroneous, a case of Aristotelian fragmentation. While it uses a very complex "fireworks" technology - with great effect on the

public, which often outshines the true situation and provides a true playground for scientific seekers of knowledge - its real nature is that of a social phenomenon of cultural change, as was that of the hominids when they left the primeval forest's trees for the level spaces of the primeval plains. That cultural change also occurred thanks to and by means of a newly found /16 "technology" (that of walking in an erect posture), as it also implied a paradigm change of expanded horizons and increased complexity.

SPACE TRAVEL - A SURVIVAL TOOL

How can we continue to grow, as an integral part of this expanded cosmic Nature, living symbiotically with it, transforming/evolving, without impermissible interventions in it? Which interventions are impermissible? Without consensual ethical principles we obviously come to a critical dividing point here. We have thus arrived at the need pointed out initially for a reconsideration - a forward reconsideration, at that.

With regard to the new ethics, it does not view the decay of old structures around us exclusively as destruction and chaotic dissolution, but rather perceives the new, emerging organization. I am firmly convinced that to this end the humanism of growth must stand in close and even causal relation to the new possibilities of space travel. It endows third millenium man with a new self-awareness, as a member of a global community and as a cosmic being, and for the first time offers the opportunity of creating peace on Earth.

Because in this period of worrying arms races, space introduces new aspects that did not previously exist and that constitute something new in comparison with the traditional arms race

confrontations. On the one hand, the systems that would be needed to make space truly dangerous for the human race are so enormous and so expensive that the cost could not be borne in the long run. Space travel is self-inhibiting--space does not allow trees to grow into heaven. The reverse of this aspect is positive also: true large-scale projects in space are practical /17 only if well-intentioned - i.e., peaceful - collaborations of many nations, for the very same reason. In addition, space travel provides challenges to our creative abilities and competitive will that surpass anything possible - in terms of inspiring tasks - on Earth. These are challenges that allow us to give free rein to our natural aggressivity, without directing it against each other. They add new values to our economy where war destroys it. And finally, the expansion of our environment into space provides us with a new philosophical perspective: we have our "elbow-room" and need not mutually destroy each other to find new living space, if we don't want to. The new self-awareness as cosmic beings adds new self-respect to those seeking it.

INTEGRATED MAN - A FORWARD RECONSIDERATION

As we already saw above during the consideration of the dynamics of complex system structures, the important thing in our walk on the paths into the future is precisely the path - seen as a process within us - and not some statistical/probabilistic goal. There are many goals: there are the regularly stillborn "scenarios" of the futurologists of the "Club of Rome" type; but what is needed in our dilemma is the path. But turning away from a goal in favor of the path also means turning towards being instead of having, to the action instead of the tool, and towards feelings rather than reason alone. Since this holistic path is an inner process, it can not be "force-fed"

from the outside; it can at most be stimulated, as a model and by example (for instance, by including art in the rational engineering/scientific education). It is primarily a matter of self-experience.

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What was it Goethe said?

If you don't feel it,
you'll never hunt it down,
unless it springs out of your soul.

Let us remember that the greatest Humanists in history were often also great scientists and technologists: Leonardo da Vinci, Baruch Spinoza, Alexander von Humboldt, Thomas Jefferson, Goethe and many others, including Einstein, a near-professional on the violin. The processes must be internally generated and just as the integrated man gradually build his self holistically, so must mankind develop its own self-awareness as a global community on "spaceship Earth". The individual can resort to such means as group exchanges, the study of literature, artistic activity, meditation, etc., in order to round out his awareness, learning to tap the level of his mythical roots in the unconscious, and to view himself as a process in time. Global humanity requires great amounts of technology, in contrast, to achieve this: for information and coming together (communications, education and transportation), as well as to overcome hunger and poverty, ignorance and disease - the four apocalyptical figures of modern times. Until they are vanquished there will be no peace on Earth and no equality or unanimity.

In traversing rapids, we say "Don't push the river: steer the boat". If with intelligence and energy we can steer our way towards the new Humanism and growth, if we can survive the rapids of transition, we shall have opened new co-evolution potentials for the inner man and for the material aspects.

Here, the work of the engineer - and especially, space technology - offers new possibilities, and therefore I don't see high-level technology and inner growth as mutually contradictory. /19
Rather, I see them as compatible, probably connected by natural law, which means that we are programmed - for growth. Towards an open-ended future.